Summary: It is well known that given two probability measures $\mu$ and $\nu$ on $\mathbb{R}$ in convex order there exists a discrete-time martingale with these marginals. Several solutions are known (for example from the literature on the Skorokhod embedding problem in Brownian motion). But, if we add a requirement that the martingale should minimise the expected value of some functional of its starting and finishing positions then the problem becomes more difficult. [M. Beiglböck and N. Juillet, Ann. Probab. 44, No. 1, 42–106 (2016; Zbl 1348.49045]) introduced the shadow measure which induces a family of martingale couplings, and solves the optimal martingale transport problem for a class of bivariate objective functions. In this article we extend their (existence and uniqueness) results by providing an explicit construction of the shadow measure and, as an application, give a simple proof of its associativity.

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60G42 Martingales with discrete parameter

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References:


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